

## BUILDINGS ON A CLAYEY OR SILTY FOUNDATION.

FOUNDATIONS of this kind require great precaution to prevent subsidence of the buildings erected upon them. The whole of the land in this neighbourhood (Beverly-road, Hull), and also of that upon which the town is built, is of this description, and no care whatever is taken, with very rare exceptions, to guard against the settling of buildings; in fact, it does not seem to be thought necessary to use any means to prevent this serious evil. And the settling down of foundations is not the only evil; there is another which is, if possible, still more serious, as it affects the health of persons residing in houses built upon the soil, without any precaution to prevent the ascent of moisture through the brickwork in contact with the earth, and from under the floor of the several apartments lying immediately over the surface of the ground. The superior temperature of the air within the walls of a house, always has a direct tendency to produce evaporation from the site upon which it is built, and to bring up with it the miasma from the soakings of bad drains in the neighbourhood.

It is a common practice here in Hull, to simply excavate the ground for the foundations, and to lay them with the worst bricks and mortar at hand; sometimes indeed, a little more precaution is taken to prevent settlement by laying York landings for the footings of the walls to rest upon, but then how are they laid? why, just with the least possible trouble, and without ascertaining if the soil is of uniform solidity, and capable of sustaining the superstructure in all parts without sinking. For want of this precaution and attention to drainage, part of a range of fine buildings has settled so much, as to involve a very serious outlay in repairing the mischief, although only executed within the last four years. In a large public building in this town, the whole of the walls, several hundred feet in length, were covered their entire breadth, when at a height of six inches above ground, with sheet zinc bedded in loam, and the first course of bricks laid upon it also bedded in the same material. It was supposed that the zinc would prevent the ascent of moisture, and no doubt it would whilst it remained in a sound state, but it was found on breaking through the foundations nine months after, for the purpose of laying hot and cold water pipes in various parts of the building, to be every where pierced with holes and in a state of rapid oxidation, and there can be little doubt that it has now (fourteen months since) nearly all disappeared. It was argued at the time, that the bedding in loam, instead of mortar, would prevent oxidation, but such was not the effect of the means here employed; moisture and the air mixed with it, appear to have been the principal agents in the decomposition of this worthless material, worthless at least for such purpose as the one for which it was in this case used.

In this locality, all buildings are sure to settle when built upon foundations laid in the ordinary manner, and the greater the weight of the superincumbent mass, the sooner this effect becomes visible, and it goes on imperceptibly through a series of years, until the house becomes seriously dilapidated, damp, and greatly reduced in value and rental. In smaller matters, such as fence-walls, gatepiers, dwarf-walls for iron railing, &c., the same cause is in constant operation, but with less effect; it does not so soon shew itself, but is equally certain to disturb the arrangement of every thing resting upon foundations so laid. It is a rare circumstance to find any such erections in a perpendicular position, after the lapse of a very few years.

The settling here described, appears to be caused, first, by the compression of the clay, which is, as I have before said, everywhere more or less silty, and greatly varying in density, the latter condition being very much affected by the water it may contain. Secondly, after a house is built and supplied with drains which take off the water at a level below the foundations, the soil gradually becomes drier and as a matter of course contracts; this lets down the foundation, and the house sinks, but not in all parts alike, as some parts may become less dry than others. Thirdly, the drains may not be placed so low as the footings of the walls, and where this is the case, and they are not soundly constructed, the leakage from

them will soak into the soil under the foundation, and reduce the solidity of the earth upon which they rest. There is another cause in constant operation throughout the soil in this neighbourhood, I mean the drainage going on internally during dry seasons, when from the peculiar nature of the soil, large fissures are produced which form continuous drains in all directions towards the nearest outfall; the effect of such drainage is to dry the soil and cause it to contract, thereby letting down buildings standing upon it. The same peculiarity of the soil, causes a ready absorption of water in wet seasons, which percolates horizontally and in other directions for a considerable distance under buildings, thereby reducing the solidity of the soil upon which they rest, producing the same effect from opposite causes.

The action of water or moisture in softening and reducing the solidity, and of drainage and spontaneous evaporation in contracting the bulk of the soils here described, would have no such effect on gravelly or stony foundations, as may be illustrated by filling one vessel with silty earth, and another with sea gravel: water poured into the first, will of course reduce its solidity, or if the same vessel is placed in dry air, the moisture mechanically mixt with the clay will evaporate, and the earth will contract; the effect in either case will be to render it less fitted to sustain a superincumbent pressure without settling; but it is not so with the vessel containing the sea gravel, the water poured into it will produce no change, the particles of hard matter being in contact, and not liable to be acted upon by the water passing through them, will remain unchanged as to solidity under all circumstances of pressure. This view of the case will shew the advantage of using concrete, in which we have, if it is composed of proper materials, a good example of the incompressible nature of a foundation so prepared, and of its other important property, namely, that of being impervious to moisture. The materials employed in concreting, should be sufficiently hard to sustain any weight placed upon them, without crushing; the particles should be in contact, and the lime used should be in such proportions, as would be just sufficient to fill the interstices betwixt them, which by adhesion to their surfaces would form a bond to the whole,—such at least is my view of the nature of concrete.

When concrete is laid in an excavation, it becomes a solid mass of uniform density, and in time so hard, as to sustain the weight of a building uniformly over the whole of the foundations; if the soil under it is less solid in one place than another, the concrete will equalise the pressure upon it, on the same principle as an inverted arch, or other well known modes of discharging pressure in the construction of walls. Concrete should be thinly spread, say from 3 to 6 inches, over the whole area of the space under the floor of ground floors, for the purpose of preventing the ascent of moisture.

I have noticed the settlement in many buildings in this place. In gates seven feet high, where sufficient care has not been taken to prepare the foundation, the settlement has thrown them from one to three inches out of the perpendicular, and the effect has been to produce a disruption in the iron railings, &c. attached to them. In fence walls, there is still greater mischief produced by this careless way of laying foundations, but then any thing seems to be thought good enough for this sort of walls. The settling of the walls in small two-story houses is not so readily detected, but it shews itself in a year or so, by defects in the openings of doors, windows, ceilings, &c. In a range of large houses, built within the last three years, upon what was said to be dry ground, I have noticed a settlement already in the front walls (and the landings under the small porches over the doorways have gone down with them) of from two to three inches. The late remarkable dry season has produced a settlement in houses here, which had remained firm since 1839, caused no doubt by the contraction of the earth under them. Speculative builders are not always aware of the existence, that a house does not begin to shew its defects until it becomes seasoned by time and occupation.

If the builders in Hull, and other places similarly situated, would reflect on the evils produced by building upon weak and un-

sound foundations, they would find it their interest, and the interest of those who employ them, to pay more attention to this, the most important of all matters connected with building.

There is one simple plan which I have never seen adopted here, and it seems strange that it is not; it is that of paving the bottom of the excavation for a foundation, with hard-burnt bricks, on edge, filling up the interstices with a grouting of lime and small gravel, and then ramming them down with a paviour's rammer; a man accustomed to this work (and such men may always be hired) would do the whole of the foundations of a small house in one day. It is fair to suppose that the force here employed would be equal to the dead weight of the walls of a two-story house, and would consolidate the earth as much as if compressed by the weight of the walls without such ramming, thereby preventing the settlement by compression.

It would confer a great favour on many persons who build small houses, and who never think of employing any one but a common bricklayer, if some of your scientific correspondents would give a few examples for making concrete with different sorts of materials, and the proportions to be used; such things are known to professional men, but they never reach the ears of that description of persons who build houses, here and elsewhere, for the labouring classes; it would add much to the comfort of the working man, if the owners of small tenements could be made to understand that he could build his houses cheaper and better by using a little concrete in the foundations.—I am, Sir, &c.

HENRY LIDDELL.

## PAYMENT TO BUILDERS FOR TENDERS.

SIR,—Having been a subscriber to your journal from the commencement, I of course have had the opportunity of observing your frequent kind attention to the interest of your correspondents, and am therefore induced to request the favour of your opinion in the following case. On the 11th August last, I was invited to tender for the erection of stabling, coachhouse, and other offices for a gentleman in this village. Accordingly, I attended the surveyors' office, and saw the drawing, and in reply to a question as to who the persons were that it was to be submitted to, was cautiously told "none but those in whom they had the greatest confidence." I prepared my estimate, and at the appointed time, August 21st, at half-past ten o'clock, attended again at the office with my tender. After waiting upwards of an hour beyond the time, and only one other person being in attendance, the two were opened in the presence of the employer and the junior surveyor; my amount was 415*l*. the other, 477*l*. 10*s*. 6*d*.

The employer expressed great surprise, and said he had been much misled; as the surveyor had stated a much less sum than either, and he therefore thought he had better pay me my per centage for my estimate, and abandon the job altogether. The junior surveyor thought otherwise, and that it had better stand over until he had seen his principal, and write to me upon the subject. Before I left, I put the question, would they receive any tender that might come in after we had left? to which the employer replied, "certainly not, business was business, and as they did not come to time, he would have nothing to do with them." I never received any communication whatever from either party, but on September 3rd, to my still greater astonishment, found operations had commenced. I immediately wrote for an explanation, and received a reply to the effect, "that another person had been applied to, whose tender (360*l*.) had been accepted, enclosing the several amounts, as under," &c. I need not ask you whether such conduct is not most disgraceful to any professional men wishing to be thought respectable. The reply evidently implies that the latter tender had been solicited at the same time as ours, but I am firmly convinced, both from what fell from the employer at the time of opening, and circumstances that have come to my knowledge since, that the surveyors, finding they had overdrawn the amount, and still wishing to maintain their statement, subsequently applied to the third person, who is doing other work